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Crystallization and Microstructure Formation of PLLA and Poly(*L*-lactide-co-*meso*-lactide) Random Copolymers

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Beamline(s): X27C

Time-resolved synchrotron wide- and small-angle X-ray scattering experiments were performed at beamline X27C at NSLS, BNL, in order to investigate the crystallization behavior and microstructure development of poly(L-lactide) (sample A) and two poly(*L*-lactide-co-*meso*-lactide) random copolymers with the R stereoisomer contents of 3 (sample B) and 6 mole % (sample C). With increasing defect content, bulk crystallinity decreases and crystallization is retarded significantly, as shown in Figure 1. The SAXS microstructural parameters at the end of isothermal crystallization (Table 1) show that there is no change in average long period with comonomoner content. However, an increase in amorphous thickness and decrease in lamellar thickness was observed with increasing R stereoisomer content. A more detailed analysis is in progress.

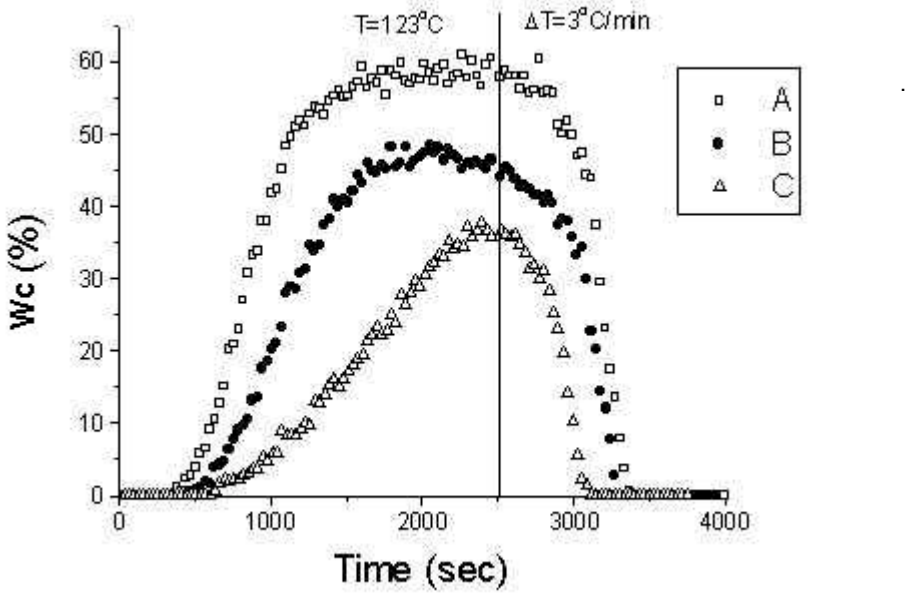

Figure 1. Development of bulk crystallinities of polylactides at T_c = 123 °C. The vertical line indicates where the isothermal crystallization experment ended and the melting experiment began

Table 1. Microstructure parameters at the end of isothermal crystallization (T_c = 123 °C)

Sample	$t_{1/2}$ (sec)	W_c (%)	L (nm)	l_c (nm)	l_a (nm)
PLLA (A)	850	61	20.5	13.8	6.7
3% meso (B)	1080	48	18.5	11.3	7.2
6% meso (C)	1575	35	19.3	8.1	11.2